

**STUDIES ON NEOTROPICAL SLIME MOLD/BEEBLE  
RELATIONSHIPS, PART I: NATURAL HISTORY  
AND DESCRIPTION OF A NEW SPECIES  
OF *ANISOTOMA* FROM PANAMA  
(COLEOPTERA: LEIODIDAE)<sup>1</sup>**

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*Abstract.*—Adult and larval specimens of *Anisotoma plasmiodiophaga*, new species, were collected from an unidentified slime mold plasmodium in a montane cloud forest at Volcan de Chiriqui, Panama. The species is described, based on adult characters, and assigned to the *errans* species-subgroup based on apotypic structure of the aedeagus. Natural historical and taxonomic relationships are discussed, and geographic distributions of Mexican and Middle American species of *Anisotoma* summarized.

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Natural historical and cladistic relationships of the slime mold beetle genus *Anisotoma* (Coleoptera: Leiodidae) were discussed in a previous paper (Wheeler, 1979a). At that time, species of *Anisotoma* in America north of Mexico seemed to be associated with mature fruiting bodies of slime molds (Myxomycetes), while species from Mexico and Guatemala were known only from Berlese samples of leaf litter taken in montane oak and pine forests. A species of *Anisotoma* was recently discovered in montane Panama, however, feeding on a plasmodium. This both extended the southern geographic limit of the genus and implied broader ecological relationships, for at least some species.

Implications of this discovery to ideas about slime mold/leiodid relationships and a synthesis of the evolution of slime mold feeding in the family will be detailed elsewhere.<sup>2</sup> The purpose of this paper is to make known this

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<sup>2</sup> Studies on Neotropical slime mold/beetle relationships, Part II: Evolution of myxomycetophagy in Leiodidae, in preparation.



Figs. 1-2. Habitat of *Anisotoma plasmodiophaga*. 1, "Bajo Grande" at Volcan de Chiriqui, Panama, near Cerro Punta. 2, Log from which slime mold and beetles were collected.

new species of *Anisotoma*, and briefly discuss some aspects of its natural history.

#### MATERIALS AND METHODS

I have seen only specimens of the type-series of *Anisotoma plasmodiophaga*, all of which I collected in Panama. Acronyms used in the text refer to museums in which type-specimens are deposited: USNM (U.S. National Museum of Natural History, Smithsonian Institution, Washington, D.C.), CNCI (Biosystematics Research Institute, Ottawa), MCZC (Museum of Comparative Zoology, Cambridge, Massachusetts), and CUIC (Cornell University, Department of Entomology, Ithaca, New York).

Disarticulations were prepared as in previous leiodid studies (Wheeler, 1979a, 1979b). Lactic acid was used in temporary depression-slide mounts to examine and study morphological structures. Drawings were made using a Wild model M-12 compound microscope with attached drawing tube.

Table 1. Mexican and Middle American *Anisotoma* beetles. Distribution of taxa in A, America north of Mexico; B, Sierra Madre Occidental; C, Central Plateau of Mexico; D, Sierra Madre Oriental; E, nuclear Middle America; F, southern Middle America; G, South America; H, sister-group distribution (estimated as areas A-G). Data from Wheeler (1979a).

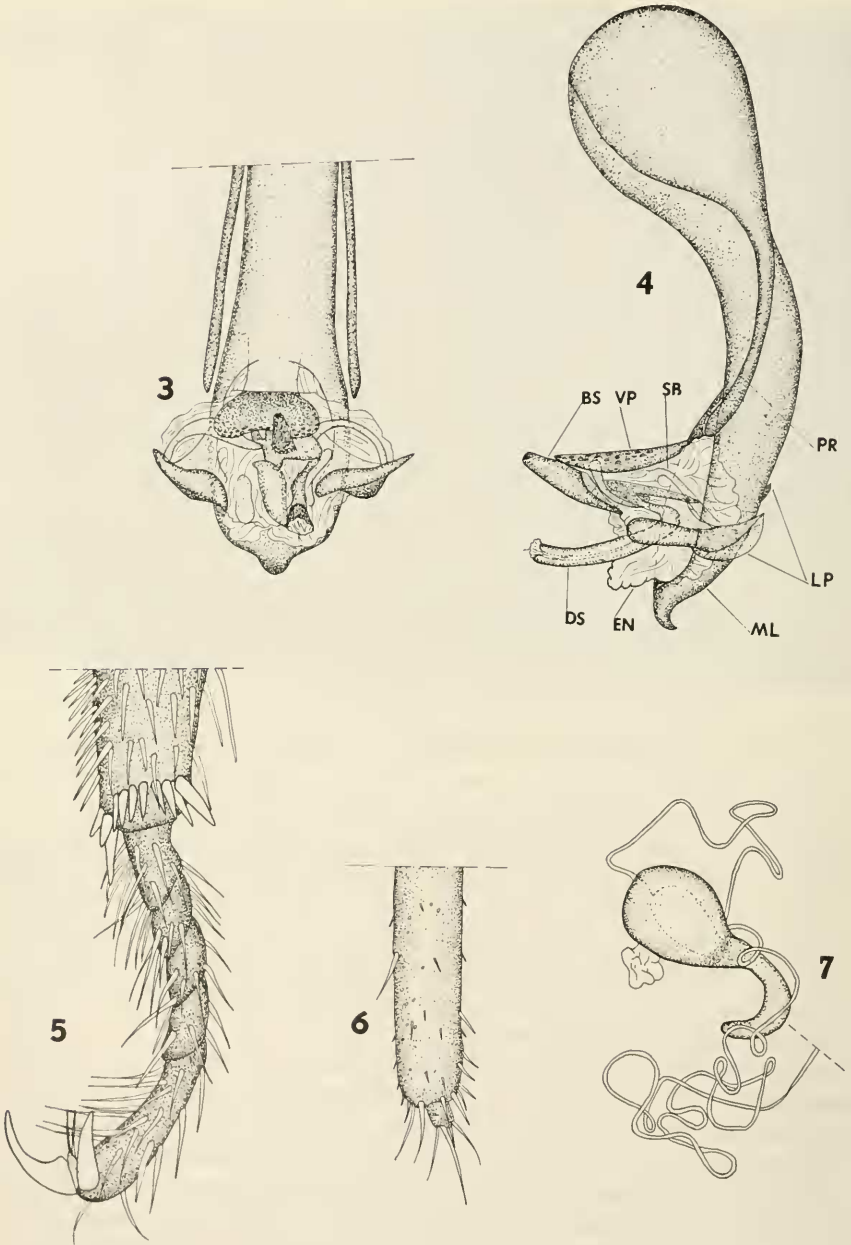
Species group or subgroup	Species	A	B	C	D	E	F	G	H	
<i>errans</i> subgroup	<i>A. mexicana</i> (Champion)	-	+	-	-	-	-	-	} A	
<i>errans</i> subgroup	<i>A. maculata</i> Wheeler	-	-	+	-	-	-	-		
<i>errans</i> subgroup	<i>A. hidalgoensis</i> Wheeler	-	-	-	+	-	-	-		
<i>errans</i> subgroup	<i>A. latustriata</i> Wheeler	-	-	-	-	+	-	-		
<i>errans</i> subgroup	<i>A. sinuosa</i> Wheeler	-	+	-	+	-	-	-		
<i>errans</i> subgroup	<i>A. campbelli</i> Wheeler	-	-	-	-	+	-	-		
<i>errans</i> subgroup	<i>A. montana</i> Wheeler	-	+	-	-	-	-	-		
<i>errans</i> subgroup	<i>A. exigua</i> Wheeler	-	-	+	-	-	-	-		
<i>errans</i> subgroup	<i>A. colima</i> Wheeler	-	+	-	-	-	-	-		
<i>errans</i> subgroup	<i>A. tenulucida</i> Wheeler	-	-	-	+	+	-	-		
<i>errans</i> subgroup	<i>A. plasmodiophaga</i> Wheeler	-	-	-	-	-	+	-		
<i>glabra</i> group	<i>A. reticulonota</i> Wheeler	+	+	-	-	-	-	-		A
<i>scopula</i> group	<i>A. scopula</i> Wheeler	-	+	-	-	-	-	-		A
		1	6	2	3	3	1	0		

### NATURAL HISTORY

Adult and larval specimens of *Anisotoma plasmodiophaga* (described below) were collected under bark on a log (Fig. 2) along with their plasmodial slime mold host at Volcan de Chiriqui, Panama, between 6000 and 7000 feet elevation. The site (Fig. 1) was a large montane valley known locally as the "Bajo Grande," situated about 2 miles southeast of Cerro Punta, and was reached by foot on the old "Boquete Trail." A mixture of forest and pasture characterize the area, and many old fallen trees provide an abundance of substrata for lichens, fungi, and slime molds in the midst of favorable temperatures and ample moisture, both important criteria for host life-cycle completion (Martin and Alexopoulos, 1969).

Ingestion of plasmodium by adults and larvae was observed in the field, and confirmed by microscopy in the laboratory. Attempts were unsuccessfully made to rear the host to maturity, and a sclerotium (dormant plasmodial state) was formed. The sclerotium was temporarily revived to an active plasmodium in the laboratory on damp filter paper with oat flakes (see Gray and Alexopoulos, 1968; Olive, 1975, for laboratory rearing information). A second sclerotium developed and could not be induced to activity.

The loosely attached bark was also sparsely populated on its outer surface by a polyporaceous fungus. Beneath the bark, along with the *Anisotoma*



Figs. 3-7. *Anisotoma plasmodiophaga*. 3, Aedeagus, ventral aspect. 4, Aedeagus, lateral aspect. 5, Female protarsus. 6, Coxite and stylus of female genitalia. 7, Spermatheca. See description for explanation of abbreviations.

specimens, were adults of an undescribed species of *Aglyptinus* (Leiodidae), and a potential predator, *Philonthus* sp. (Staphylinidae).

#### TAXONOMIC AND ZOOGEOGRAPHIC CONSIDERATIONS

Several Neotropical species of *Anisotoma* were described in a previous paper (Wheeler, 1979a), before which only one species was recorded from New World areas south of the United States. The single species described here raises the total number of species in Mexico and Middle America to thirteen (Table 1), and extends the known geographic range of *Anisotoma* south to Panama from Guatemala. One Mexican species also occurs in the U.S., six species occur in the Sierra Madre Occidental, two in the Central Plateau, three each in the Sierra Madre Oriental and nuclear Middle America, and one in southern Middle America; no species are known from South America. All of these species, except *A. reticulonota* Wheeler and *A. scopula* Wheeler, belong to the monophyletic *errans* species-subgroup (Wheeler, 1979a), also represented in the U.S. While these figures are strongly biased by limited collections from relatively few localities of the Neotropics, they continue to support a hypothesized northern ancestry for the *errans* subgroup lineage, and emphasize the success of *Anisotoma* in Middle America. Additional collecting is badly needed to provide specimens and locality data for accurate delimitation of intraspecific variation and analysis of zoogeographic relationships.

The following description of *A. plasmodiophaga* is based only on adult characters. Larvae were collected, but are not described here.

#### *Anisotoma plasmodiophaga* Wheeler, NEW SPECIES

Figs. 3-7

**Diagnostic combination.**—Elytral interneurs obscure, but distinguishable; metasternal fovea paired; endophallus (Figs. 3, 4) with spatulate lateral plates, and basal and distal spines.

**Description.**—Characters of *Anisotoma*, *horni-errans* species group, and *errans* species-subgroup (*sensu* Wheeler, 1979a). **Body:** Convex, attenuate behind, length about 3.3-3.7 mm. **Color:** Head nearly black with central spot and anterior margin reddish brown; mouthparts, venter, and antennomeres I-VI, VIII, and (apex) XI more yellowish; elytral disc reddish brown to black apically and laterally; tibia black, femur and tarsus yellowish; pronotal disc nearly black, margin and anterolateral areas yellowish to reddish. **Head:** Punctules sparse, fine, setose. **Pronotum:** Punctules smaller and more sparse than on head. **Elytra:** Punctules sparse, slightly larger than on head, serial pattern obscure but distinguishable. **Male:** Metasternal fovea paired, minute, punctiform; femora without denticles; aedeagus short, stout (Figs. 3, 4); median lobe (ML) clavate, apex pointed, dorsally curved; ventral piece (VP) cordate; parameres (PR) about  $\frac{3}{4}$  length ML; endophallus (EN)



armature complex, with a stout basal spine (BS) and distal spine (DS), broad, spatulate, lateral plates (LP), and lateral semi-sclerotized bands (SB). *Female*: Tarsi 5-4-4 (Fig. 5); styli short, with single long apical seta and about three shorter setae (Fig. 6); coxites (Fig. 6) long, cylindrical, with several apical setae; spermatheca (Fig. 7) bulbous, distal process curved, wider at middle, duct long, thin, gland present, lateral.

Types.—Holotype ♂ (USNM), Paratypes 4 ♂, 4 ♀ (USNM, CNCI, MCZC, CUIC), from type-locality (Panama, Chiriqui Province, about 2 miles southeast of Cerro Punta, elev. 6000–7000 feet).

Phylogenetic relationships.—Apotypic form of the median lobe apex is shared by other members of the *errans* species-subgroup.

Comments.—Collected in August, under conditions described under "Natural History" above. The basal (BS) and distal (DS) spines of the endophallus are connected by sclerotized structures more or less continuously. A couple of areas distally on the endophallus may be very slightly sclerotized, in addition to the lightly sclerotized bands mentioned in the description (Fig. 4).

Etymological note.—Combination of noun for trophic stage of slime mold life cycle, *plasmodium*, and Greek *phagein*, to eat, referring to feeding habits of the species.

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The Smithsonian Tropical Research Institute permitted use of the Barro Colorado Island facilities in the Panama Canal Zone. Henry Stockwell and Padre Baldwin arranged for use of a cabin at Volcan de Chiriqui. Roland Seymour (Department of Botany, The Ohio State University) gave advice during attempts to rear the host slime mold. Larry Watrous identified the staphylinid beetles. Ginter Ekis and Charles Triplehorn read and commented on drafts of the paper.

#### LITERATURE CITED

- Gray, W. D. and C. J. Alexopoulos. 1968. *Biology of the Myxomycetes*. Ronald Press, New York. 288 pp.
- Martin, G. W. and C. J. Alexopoulos. 1969. *The Myxomycetes*. Univ. Iowa Press, Iowa City, 560 pp.
- Olive, L. S. 1975. *The Mycetozoans*. Academic Press, New York, 293 pp.
- Wheeler, Q. D. 1979a. Slime mold beetles of the genus *Anisotoma* (Leiodidae): Classification and evolution. *Syst. Entomol.* 4: 251–309.
- . 1979b. Revision and cladistics of the Middle American genus *Creagrophorus* Matthews (Coleoptera: Leiodidae). *Quaest. Entomol.* 15: 447–479.